Insights

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Ontario Forest Research Institute
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What is it about white pine?

A look at the status and regeneration of Ontario's provincial tree

By Abigail M. Obenchain

No tree seems to inspire as much reverence and passion as the white pine. It is the official tree of not just Ontario but also the states of Michigan and Maine. Maine even named the tree's cone as its state flower. Minnesotans are just as wild about white pine. They've formed a White Pine Society devoted to the conservation of just this one tree species, and for better or for worse, the North Star Chapter of the Sierra Club recently tried to lead a voluntary ban on *all* white pine harvesting in Minnesota.

So what *is it* about white pine? Why aren't people out there forming societies for black spruce or jack pine?

For starters, when nature made this tree, she (or he) was having a very good day. With its soaring height, massive, straight trunk, and almost primeval-looking crown with soft, feathery needles, white pine can't help but impress. Walking in a grove of old-growth white pine is often compared to walking through a cathedral. It is the tallest tree species in Ontario, and in fact, until recently, the official tallest tree in the province was a white pine near Thessalon, which soared to more than 50 m. (It blew down a few years ago, so the current tallest tree is a 45 m white pine near Haliburton.)

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(photo by Andrée Morneault)

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Cette publication technique n'est disponible qu'en anglais

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White pine is also one of the longest-lived tree species in this part of the world: Traditionally it was thought to live for at least 400 years, but according to OFRI scientist Bill Cole, who is conducting dendrochronology work on ancient white pine logs lying along lakeshores in Algonquin Park, some may live more than 500 years.

Its role in the ecosystem is also significant. For example, bear sows use large white pines as their daycare centres; in summer, they send their cubs up these trees during the hottest part of the day. And ancient white pine logs along lakeshores can persist for many centuries, providing shelter for young trout and habitat for a diverse range of other plants and small creatures.

White pine is not only a natural masterpiece but also a pillar of Ontario's history and culture. For generations it has had both spiritual and practical value for many First Nations people, who used the inner bark as an emergency food source and the resin to seal canoes. The first European settlers in Ontario must have been in awe of the "endless" supply of behemoth pine boles for buildings, furniture, and, of course, ships' masts. Its wood is durable and resists warping. It has always been one of the most important economic species in the province.

Today, however, white pine's status is uncertain. Some experts say that it has been dramatically reduced across the landscape and is not regenerating well. Others assert that while we still have plenty of white pine, we've lost most of the old-growth stands and the ecological values that go along with them.

OFRI scientist Ajith Perera, who has lead several landscape-scale studies on white pine, warns that determining how much white pine we've lost is tricky. First, we don't know how much white pine – old or otherwise – was growing in Ontario before European settlers arrived, because forest inventories weren't available until 50 years ago. Second, white pine generally grows *with* other species in mixtures, so defining a white pine forest, old growth or not, is complicated. Plus some younger stands may not be visible on aerial forest inventory photos if they are growing under a hardwood canopy.

Checking for redback salamanders at the French River 1 site (see Page 4), where researchers are assessing the effects of site preparation treatments on various components of white pine ecosystems. (Photo by Andrée Morneault)

What experts *do* seem to agree on is that white pine is facing some serious challenges and that solving the regeneration problem is critical.

The challenges of regenerating white pine

Several OMNR employees were surveyed to get their views on white pine regeneration issues, including Bill Parker and Wayne Bell, OFRI scientists working on white pine regeneration; Tim Meyer, a manager at OFRI, formerly the provincial forest pathologist and a blister rust expert; Sylvia Greifenhagen, an OFRI forest health forester; Andrée Morneault, a vegetation management specialist, and Fred Pinto, a conifer specialist, both based at OMNR's Southcentral Science and Information office in North Bay; and Dave Deugo, a forester at OMNR's Bracebridge office who has spent many years grappling with the white pine regeneration problem. Here's a summary of their concerns:

- **Lack of seed source:** In the past, the large dominant pines that produce the lion's share of the seeds were the first to go to the mill.
- **Fire suppression:** White pine evolved with fire, which consumes the forest floor litter and exposes the mineral soil seedbed that white pine seeds like, reduces overhead shade, and minimizes competition from other plants. Decades of fire suppression have resulted in low germination and seedling survival rates. Because fire is so important in regenerating white pine, several of the experts would like to see more refinement of prescribed burn techniques; however, this method can be costly to use and tricky to implement.
- **Competition/succession:** Without fire, other plants outcompete white pine seedlings; thus, many white pines stands have converted to other conifers or poor-quality hardwoods.
- **Blister rust:** White pine did not evolve with this imported disease and has little resistance to it. It occurs across the province, and large-scale infection and mortality have occurred in central and northeastern Ontario. It is a significant cause of white pine regeneration failure on certain sites and was thought to be worse in clearcuts, but more recent data indicates that it can cause serious problems in shelterwoods as well. Meyer says he can now identify blister rust on the smallest seedlings and that it may be a far more significant cause of early seedling mortality than previously thought.
- **White pine weevil:** Decades of clearcutting have given this native pest the upper hand, as it prefers to attack thick leaders, like those found on young pine growing in the open, and likes sunny conditions. Conversely, other insects that feed on weevil like some cover. Finally, no pesticides are currently approved for weevil control in the forest.

How OMNR is involved in white pine regeneration research and science

• ***A Silvicultural Guide for the Great Lakes-St. Lawrence Conifer Forest in Ontario:*** Published by OMNR in 1998. *Focus*: "In this guide we attempted to incorporate ecological theory into our practices," says Pinto, who led its writing. "Under conventional forestry practices, the largest pines were removed, leaving smaller pines, balsam fir, white birch, poplar, and other trees considered less marketable, resulting in much less white pine across the landscape."

The new provincial guide presents practices designed to mimic natural disturbance (fire) patterns more closely and thus protect large seed trees and small isolated populations that may have locally adapted genetic material; produce seedbeds that favour white pine natural regeneration; minimize competition from other plants; keep the white pine weevil in check; reduce the risk of blister rust infection; and maintain a supply of standing dead trees and old logs for wildlife use.

"Response from both forest industry and environmental groups has been very positive," Pinto says. In 1999, the guide's core writing team received the Canadian Forest Management Group Achievement Award from the Canadian Institute of Forestry.

• **White pine weevil management project:** Completed in 1991. *Focus*: Determining whether weevil populations could be controlled by modifying forest practices to maintain habitat or microclimatic conditions of this pest's predators, both vertebrate and invertebrate. *Highlight*: The answer to this question was a definite *yes*. According to Pinto, "In areas where these practices have been used, problems with white pine weevil have not been reported."

• **Understory Prescribed Burn Expert System:** Released on CD in 1998 by OMNR's Aviation, Fire, and Flood Management Branch. *Focus*: Determining whether a specific site is suitable for an understory prescribed burn to regenerate white pine and whether the current forest, fuel, and weather conditions are appropriate. "Relatively few people across Ontario have planned, conducted, and evaluated understory prescribed burns," Morneault says. "We put together this CD to capture their knowledge and experience and allow others to put it to practical use."

• **White pine pill project:** Begun in 1992. *Focus*: Determining whether planting white pine with a pill that contains a fungicide, an insecticide, and a fertilizer can increase survival, accelerate growth to provide a competitive advantage, fend off white pine weevil, and shorten the time of greatest susceptibility to blister rust. *Highlights*: "This pill helps keep white pine growing strong until at least age 5," Meyer reports. "Then we can start to manage blister rust through other means, such as pruning lower branches. It also reduces the time until the crowns start to touch, thereby reducing moisture levels and discouraging blister rust from taking hold."

• **Wharncliffe:** Begun in 1994. *Focus*: Identifying the *physiological* effects of competition (balsam fir, beaked hazel, and bracken fern) on white pine regeneration. *Highlights*: Competition for light is the primary factor affecting white pine regeneration, with balsam fir winning the race handily. "White pine simply can't grow under balsam fir," Parker says.

Adds Bell, "Seedlings growing where none of the competitors were removed are just 10 cm taller than the day they were planted. If you can only afford to deal with one of the competitors, control the fir with motor-manual cutting or do a pre-harvest burn."

• **Ottawa Valley white pine restoration project:** Begun in 1994. *Focus*: Finding cost-effective ways to increase white pine on sites where previous selective logging reduced its abundance. *Highlights*: "Early results are encouraging," Pinto

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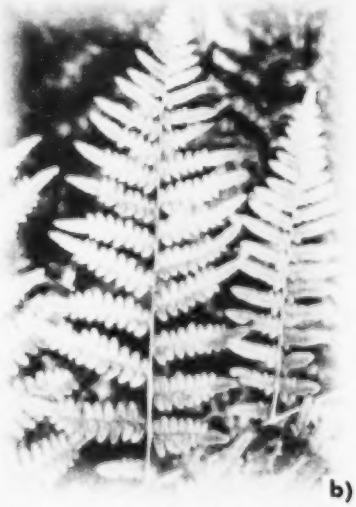

Controlling competitors such as beaked hazel (a), bracken fern (b), and balsam fir (c) is critical to ensuring pine regeneration. In a study of these species near Wharncliffe, pine seedlings in the control plot have grown only about 1 cm per year (more details above). (Fern photo by Wayne Bell; others by Amy Bolduc)

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says, "with excellent growth of planted white pine. Forest managers will be able to reproduce the results easily as the treatments studied are all commonly used today, though not in the same sequence or frequency. For example, we looked at controlling competing vegetation before seedlings were planted, where traditionally vegetation is controlled after planting."

• **Comparison of white pine removal cuts:** Begun in 1996. *Focus:* Comparing the growth response of seedlings and residual trees under different thinning intensities. "There have been no studies on removal cuts in white pine," Pinto says, "yet 20% of the area that will be harvested in white pine stands over the next 5 years will be removal cuts. This study will help improve the survival and growth of white pine seedlings that have been established after a regeneration cut." *Highlights:* Seedling growth and survival is affected by understory as well as overstory competition. Early results suggest that retaining 30% crown closure in overstory trees will result in good seedling growth as well as protection from logging damage if careful logging practices are used.

• **Management impacts assessment (MIA):** Begun in 1995. *Focus:* Assessing the ability of various site-preparation methods to favour conifer regeneration in areas where previous harvesting methods converted white pine-dominated stands to poor-quality hardwoods. *Highlights:* "In several of the treatment areas, white pine was competing well, but now blister rust is destroying it," Parker says. "We know we can maintain existing white pine stands. But it takes a lot more effort to regenerate white pine after a clearcut."

• **French River 1:** Begun in 1995. *Focus:* Assessing ecological effects of harvesting and site preparation on white pine shelterwoods on a highly productive site. *Highlights:* Site preparation treatments greatly enhance white pine seedling growth by improving the microclimate and resource availability. According to Morneault, "Using mechanical scarification does not appear to help planted white pine – height and diameter growth and competition control are as good on sites treated with chemical site preparation alone as on sites treated with the combined mechanical and chemical treatments. However, if you are looking for natural regeneration, light scarification results in higher densities."

Significant differences in the effects of the treatments have been observed, and clearly, some type of site preparation is critical to pine regeneration. "In areas that were shelterwood cut but not site-prepared, competing vegetation regrew rapidly within 2 years," Parker says. "As a result, white pine seedlings were exposed to light intensities of only about 10%, roughly similar to the heavy shade in the understory of the uncut stands. Under these conditions, white pine seedling growth is dramatically reduced, and mortality begins to occur."

Site preparation also affected other components of the ecosystem. According to Morneault, "Redback salamanders do not seem to enjoy the hotter, drier microclimates created by herbicide treatments. They do not disappear, but they are either less active or less abundant. The verdict is still out on how long it will take for conditions to improve."

• **French River 2:** Begun in 2000. *Focus:* Determining whether releasing very suppressed 10- to 15-year-old white pine growing in shelterwoods will result in merchantable trees down the road and whether a single, simple morphological indicator can be used to identify trees that will grow well if released. A lot of stands in central Ontario are in this condition, Morneault says. *Highlights:* No results are available yet, but Parker surmises that live crown ratio (a measure of the relative size of the crown) and height increment over several years (previous growth record) could be useful predictors. Final results are expected by 2005.

• **Herbicide operational monitoring project:** Begun in 2000. *Focus:* Monitoring effects of aerial herbicide spraying on suppressed trees (ages 10-15) growing in shelterwoods, in cooperation with Westwind Forest Stewardship, a Sustainable Forest License holder in central Ontario. "We want to see whether the herbicide will penetrate the shelterwood canopy and how well it will control the hardwood competition," says Morneault. "Spraying is done in the fall after the conifers have hardened off so it won't affect them." Results are expected by 2002.

• **McConnell Lake competition study:** Initiated in 2000. *Focus:* Quantifying the effects of woody and herbaceous vegetation on white pine establishment, growth, and stem quality, with the goal of developing prescriptions for when and how long competing vegetation should be controlled. Bell says, "The complex nature of this study – looking at control timing and duration at the same time we look at the woody vs. herbaceous competition – will help us develop much more efficient and cost-effective vegetation management strategies for white pine." Early results are expected by 2005. *Note: This study is lead by Doug Pitt of the Canadian Forest Service, (705)949-9461, dpitt@NRCan.gc.ca.*

• Two **blister rust** projects are in the planning stages. The first will involve screening seedlings grown from seeds collected from trees with blister-rust resistant traits, which were planted up to 50 years ago. "The amazing thing," Meyer says, "is that the new blister rust screening procedure we will be using was developed by a U.S. Forest Service researcher in Wisconsin who found that some of the more resistant trees in their genetic archive are descended from Ontario trees bred in the 1950s by the noted researcher Carl Heimburger. We searched our records and tracked down his tree archives in Ontario, several of which had changed ownership several times, and were able to collect seed from them for this experiment."

The other project is a blister rust site hazard rating project to determine the most appropriate climate data and model for predicting the occurrence of this disease at any site in Ontario. "This will help us create a decision-support tool for forest managers to use to identify the level of management that needs to occur on a given site to minimize the incidence and impact of blister rust," Greifenhagen says.

Many of these projects are being conducted in collaboration with other organizations, including the Canadian Forest Service, forest industry, and various universities. For details on any of these projects, contact the person(s) mentioned in that paragraph. Phone extensions for OFRI staff: Wayne Bell – 225; Sylvia Greifenhagen – 205; Tim Meyer – 220; Bill Parker – 212. Contact Andrée Morneault at (705)475-5566, Fred Pinto at (705)475-5563, and Dave Deugo at (705)646-5508. OMNR e-mail addresses are firstname.lastname@mnr.gov.on.ca. To order A Silvicultural Guide for the Great Lakes-St. Lawrence Conifer Forest in Ontario (cost: $27.50), contact the Natural Resources Information Centre at (800)667-1940 or mnr.nric@mnr.gov.on.ca. To order the prescribed burn CD (no charge), contact Andrée Morneault – it is also available from Robert Janser, development specialist, OMNR Fire Science and Technology, (705)945-5702, robert.janser@mnr.gov.on.ca.

New CD captures Ontario's forest fire history

Fire plays a critical role in the ecology of northern forest ecosystems, and understanding historic fire patterns will help resource managers to make wiser decisions about sustaining these ecosystems into the future. A new tool is available for understanding, exploring, viewing, displaying, and summarizing nearly 8 decades of forest fire history in the province: *Ontario's Forest Fire History: An Interactive Digital Atlas*, a PC-based CD-ROM developed at OFRI.

According to project leader Ajith Perera, an OFRI landscape ecology scientist, this CD includes historic fire data for the entire province (more than 1 million square kilometres) for 1920-1995. The current provincial fire simulation guidelines are based on this data, which was taken from several sets of hardcopy OMNR maps (based largely on aerial photos and post-fire flyovers) as well as several satellite imagery data sets.

The CD is very user-friendly, says Frank Schnekenburger, an OFRI systems analyst and member of the development team. "Anyone from students to foresters to scientists can use it. It is flexible, interactive, and responsive to users' requirements. Users can view maps of fire patterns and tables and charts of summary statistics that include the number, area, and size-class distribution of fires. They can display fires for any years or decades and for specific areas of the province, such as Hills' site regions and forest management units."

This tool breaks new ground, Perera says. "I don't know of any other spatial database *anywhere* that incorporates this many years of fire data, for this large an area."

To obtain the CD as well as the accompanying manual (Forest Fires in Ontario: A Spatio-temporal Perspective, OFRI Forest Research Report No. 147), contact the Natural Resources Information Centre at (800)667-1940 or mnr.nric@mnr.gov.on.ca. The CD costs $30.

LEAP II ranks first among 3 landscape analysis packages

In an independent analysis of 3 landscape analysis GIS software applications, OFRI's LEAP II came out ahead of Arcview-Fragstats and another package in terms of capability and ease of use. This comparative analysis was commissioned by the Oak Ridges Moraine Project and conducted by Sir Sandford Fleming College to determine which software to use to develop a decision-support tool for the challenging task of managing the Oak Ridges Moraine, a 1200 km^2 area north of Toronto that is both ecologically sensitive and a rich source of mineral aggregates.

LEAP II was developed by OFRI's Ajith Perera, David Baldwin, and Frank Schnekenburger for MNR resource managers and planners. It was first released in 1998 (see Insights Vol. 3, No. 1 and Vol. 4, No. 2). It has been available on an external web site since 1999 (visit http://www.ai-geostats.org and click on Software).

Research partnerships with forest industry in Ontario: Opportunities and challenges

By Lisa J. Buse

In 1999, the *Ontario Forest Accord* was signed by OMNR, forest industry, and the Partnership for Public Lands. This historic agreement put forward a collaborative approach to managing a wide array of conflicting pressures related to Ontario's forests. One result of this accord is the formation of research partnerships between forest industry and government.

For industry, these partnerships are a way to address concerns about minimizing the effects of a shrinking land base, maximizing fibre quantity and quality within the context of ecological sustainability, and reducing operational costs. For OMNR, they are a means to encourage industry involvement in forest research, increase the resources available for science, and promote innovation and high standards of forest practices in Ontario and across Canada.

The first of these formal partnerships, the *Forestry Research Partnership* (FRP), signed in early 2000, involves OMNR, Tembec Inc., the Canadian Forest Service, and the Canadian Ecology Centre. George Bruemmer, Tembec's manager of forestry research and development and general manager of the FRP, emphasizes that this kind of partnership is an effective way to advance the science agenda of both industry and government. "Tembec and the CEC could not have developed a program like this in such a short time on our own," he says. "A partnership approach that brings focus, money, and talent together as the FRP does provides great value to everyone involved."

Ontario's Living Legacy Trust recently endorsed the FRP approach by awarding the first grant of its science-funding program, a total of $382K, to the partnership to support its research and transfer efforts.

What are the opportunities?

Research partnerships can benefit all parties by pooling the talents, experience, and resources of staff from a wide range of disciplines. By working together to plan and carry out research, industry and government science staff can ensure that forest science in Ontario is relevant both to OMNR's long-term goal of ecological sustainability and to the immediate needs of forest industry. Coordinating planning and sharing resources reduces duplication and allows research to be conducted more efficiently and cost effectively.

Some of the projects

In 2000-01, the FRP initiated 32 projects. Those being worked on by OMNR science staff include assessing the spatial feasibility of intensive forest management (IFM), assessing vegetation management treatments for improving white pine regeneration in shelterwoods, and determining the effects of IFM on biodiversity at multiple scales. For the spatial feasibility project, OFRI Forest Landscape Ecology staff are determining the area on Tembec's license that is potentially available for IFM after all the legislative and guideline restrictions have been applied. The result will be a legally defensible spatial strategy with methods that can be applied to other forest management areas in the province in the future.

What are the challenges?

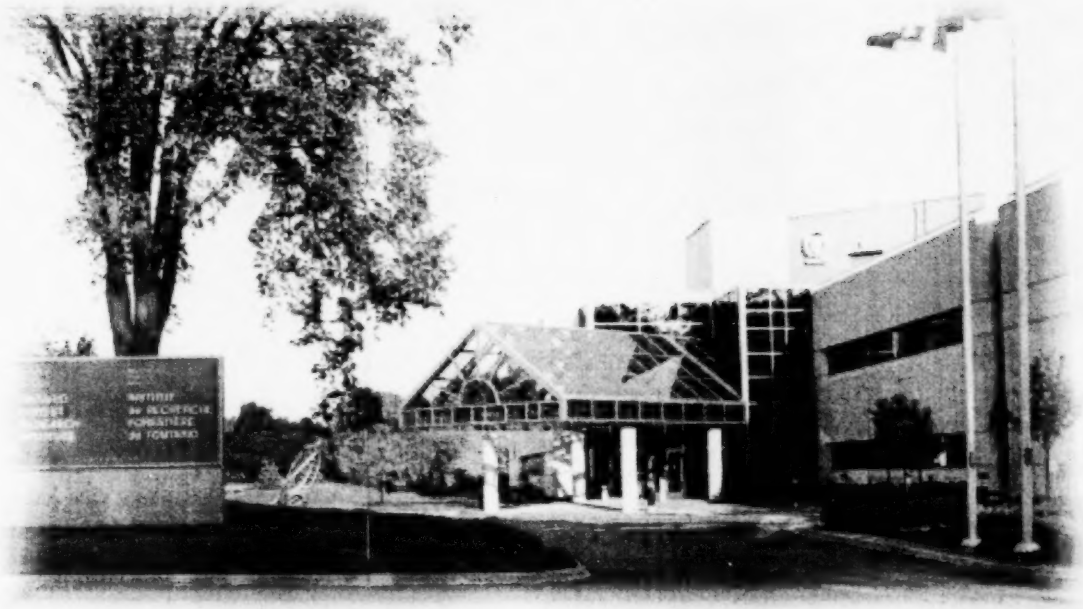
As with any new partnership, there are challenges in developing a good working relationship. The biggest seem to be organizational hurdles: determining who's responsible for what, ensuring that projects meet the objectives of all partners, setting data-sharing protocols, developing a supporting infrastructure, and ensuring that projects stay on schedule despite the other responsibilities of each partner. What's more, the long-term nature of science has industry staff concerned that they won't get answers as fast as they'd like.

Looking towards the future

The partnership is now heading into its second year; the first round of projects is being reported on, and the next round is being reviewed and approved for funding. Jim Baker, OMNR's science business coordinator, says, "We've developed a good working relationship with Tembec. The projects funded in 2000-2001 serve the needs of both forest industry and Ontario government science priorities."

Discipline-specific partnerships have also been established with forest industry in Ontario, for example, to further growth and yield and adaptive management efforts. Over the next few years, establishing and maintaining working partnerships with forest industry and other client groups across the province will continue to be a major area of emphasis for OMNR's research and science branches.

For more information about the Forestry Research Partnership and associated projects, visit http://forestresearch.canadianecology.ca or call Al Stinson, FRP forest research operations coordinator based at the CEC, (705)744-1715, ext. 111, or John Pineau, FRP technology transfer coordinator, CEC, ext. 113.



OFRI marks a decade of excellence in forest research

By Abigail M. Obenchain

On December 14, 2000, the Ontario Forest Research Institute marked its 10th anniversary, and according to general manager David DeYoe, staff had much to celebrate.

"We are thankful to have spent the last decade in one of the most advanced facilities for forest research in North America," DeYoe says. "We are reminded of that every time someone from Chile or China or even elsewhere in North America visits here. To a person, these folks are in awe of the facilities and equipment we have available to us."

OFRI was designed by award-winning architect David Ellis of Sault Ste. Marie, who regards it as one of his crowning achievements. It has 2,000 m^2 of space, with computer-automated chambers and greenhouses for growing seedlings, state-of-the-art laboratories for conducting a wide range of chemical and other analyses, and the latest computer technology.

DeYoe notes that in addition to providing top-notch research facilities, the opening of OFRI brought together several MNR forest science units that had been dispersed across the province. Over the past decade, these units have evolved into a "full-service science organization that has worldwide recognition as pushing the boundaries of research and development in support of sustainable forest management."

Accomplishments over the last 10 years include developing innovative tests for the viability of tree seeds, determining the ages of ancient logs submerged in lakes and their value to the aquatic ecosystem, and developing a specialized software tool that enables forest managers to display the province's fire history at a glance. *(See Page 8 for details.)* This work represents the latest chapter in a history of more than 55 years of forest research in Ontario.

OFRI's many successes are due not just to the facility and staff but also to a willingness to partner with other organizations, says Terry Taylor, another manager at OFRI and an overseer of its construction. "We have involved many collaborators in the work we've done over the years," he says, "including other sections of OMNR, particularly the science and information units; universities and colleges in Canada and the U.S.; and federal research agencies such as the Canadian Forest Service."

Today, the OFRI building houses not just OMNR's main forest research section but also other OMNR units, including:

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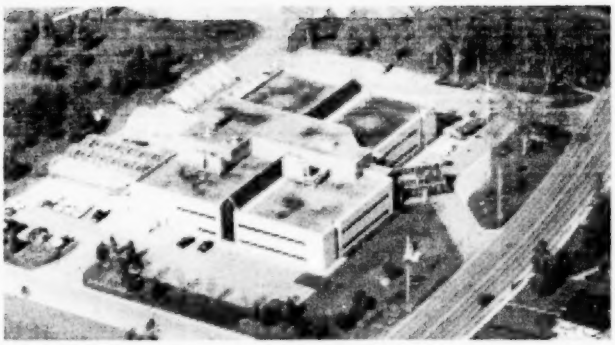

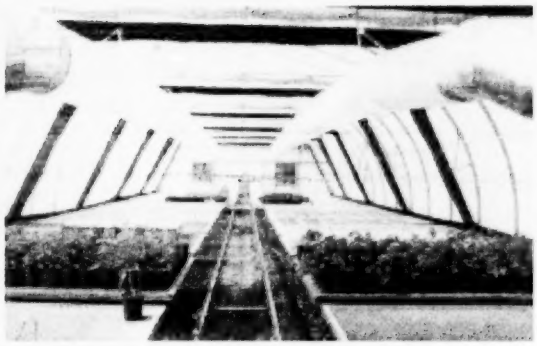

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• The director of OMNR's Applied Research and Development Branch, which oversees all OMNR research activities

• The coordinator and some staff of the Provincial Terrestrial Assessment Program, which coordinates the long-term monitoring of forest dynamics and wildlife populations across the province, as well as Ecological Land Classification

• The provincial telecommunications laboratory, which coordinates OMNR's radio, satellite phone, and lightning sensor networks

• The eastern Lake Superior office of the Huron-Superior Management Unit, which is responsible for assessing fish populations, developing and implementing fisheries management plans, and enforcing federal and provincial regulations for fisheries and fish habitat

Highlights of OFRI's research accomplishments: 1990-2000

Many of the following were accomplished in collaboration with various partners, such as OMNR's science and information units, other OMNR units, the Canadian Forest Service, and university/college researchers. They support OMNR policy and legislation through input to Environmental Assessment Terms and Conditions, CFSA-related manuals, State of the Forest Reports, silvicultural and other natural resource guidelines, and forest-management planning.

• Developing ***virtual forestry***: a broad array of computer tools for understanding forest landscapes, which have revolutionized the way Ontario's forest managers and planners do their jobs. These tools, which use geographic information systems (GIS), are enabling anyone with a PC to store, access, analyze, manipulate, layer, display, and map a broad range of geographic information at different scales, from forest stands to the entire province. Some have been used to support the development and implementation of Ontario's Living Legacy.

• Developing a system for identifying **stress in forest stands** before symptoms are visible. Researchers are using special equipment mounted on airplanes to collect data on the *spectral signature* of forest canopies – the pattern of light that leaves reflect or emit. They are also collecting data on the ground to help them determine how to "read" these light patterns for signs of forest stress. A prototype detection system has been developed and is now being tested in Ontario.

• Investigating how to change harvesting practices to promote **natural regeneration** – to ensure that young seedlings germinate and grow as they have for eons in the forest, rather than having to be planted.

• Developing a set of tests for assessing and rating the **physiological condition of tree seedlings**. Previously, the only way to tell if seedlings were healthy was to look at them, a very unreliable method. Over the decade, tests developed by OFRI have prevented the planting of millions of unhealthy seedlings around the province – at a cost of less than 1% of establishing an average plantation. Two private labs, Mikro-Tek Labs in Timmins and KBM Forestry Consultants in Thunder Bay now provide the testing services, with OFRI staff providing quality control and support.

• Discovering that the more **seedlings "glow"** after they experience stress, they better they will grow in the forest. Researchers knew that every plant emits a pattern of red light known as *chlorophyll fluorescence*, which is not visible to the naked eye. They exposed tree seedlings to stress (high heat and low humidity) and then compared their pre- and post-stress "glows." The result: seedlings that recovered well from the stress tests – as indicated by their glow characteristics – also grew better after planting. Thus, a simple 1-day stress resistance test can be used to predict how well seedlings will stand up to the rigours of handling and planting.

• Developing a test that uses a **glow-in-the-dark stain** to determine whether tree seeds are viable. The more a seed glows, the more viable it is. More effective and quicker to use than previous tests, this procedure is now is use by tree seed plants in Ontario.

• Accumulating a wealth of information on how **herbicides and their alternatives** (for example, manual brush cutters or tractor cutters) affect competitive plant species, desired tree species, and various ecosystem components. This information is helping forest managers make wiser decisions about when to use which vegetation management tool. In 1998, OFRI co-hosted an international conference on the subject, drawing 170 people from around the world to Sault Ste. Marie.

• Discovering that in Algonquin Park lakes, white pine logs lying in shallow water can be up to **1,000 years old**. Scientists are now working to understand what role these ancient logs play in sustaining fish populations and how to incorporate this information into shoreline management guidelines.

• Learning how the **1998 Ice Storm** affected woodlots, tree plantations, and sugarbushes in eastern Ontario, as well as how best to mitigate the damage. A study in sugarbushes, for example, has determined that knowing the number of live branches per tree can help producers predict the tree's capacity to produce syrup.

Today, OFRI research staff are forging new partnerships with forest industry and others to meet the forest science needs of the new millennium, including determining how climate change affects forests and which forest management practices could combat the effects of climate change, how intensive forest management practices like thinning could help improve tree growth to mitigate possible wood supply shortfalls, and how the production and harvest of non-timber forest products such as wild mushrooms and nature-craft supplies could be integrated with timber management and help improve the economies of struggling northern communities.

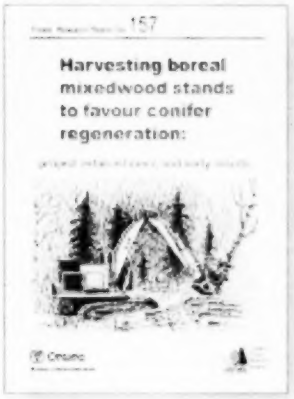
New information about managing boreal mixedwood forests

By Lisa J. Buse

Ever wondered how to develop a silvicultural treatment package for a boreal mixedwood forest that maintains or enhances the understory conifer component? Those who've applied partial harvesting in mixedwood forests know that the challenges include when to harvest so as to minimize site impacts, how much of the overstory to remove so as to minimize windthrow losses, and when supplemental artificial regeneration treatments are necessary.

Some answers are emerging from a trial in mid-successional, aspen-dominated boreal mixedwoods in northeastern Ontario, established by OFRI research scientist Blake MacDonald, in cooperation with forest industry. Interim results published in an OFRI report (*Harvesting Boreal Mixedwood Stands to Favour Conifer Regeneration: Project Establishment and Early Results,* Forest Research Report No. 157) show that partial cutting may be economically feasible but requires long-term monitoring and well-trained operators to implement.

What's more, stands with inadequate conifer advance regeneration that were subjected to 50% overstory removal required underplanting to enhance the presence of conifer in the residual stand. Removing more than 50% of the overstory resulted in too much wood being lost to windthrow and top breakage.



According to MacDonald, boreal mixedwoods are a priority for researchers because they occupy about half of the productive managed forest land in the province and thus are ecologically and economically valuable. "One of the challenges of managing boreal mixedwoods," he says, "apart from ensuring that the conifer component is maintained, is using techniques that favour spruce over the more shade-tolerant balsam fir."

Ensuring that practitioners have the most current ecological and management knowledge for boreal mixedwoods is also a priority for OMNR's Forest Management Branch. Its staff have been collaborating with science staff across the Ministry to develop a *Boreal Mixedwood Notes* binder, released in fall 2000, which contains half of about 50 technical notes that provide ecological and silvicultural information about boreal mixedwoods and their management.

A related project is the production of Ontario's first ecosite-based silviculture guide for boreal mixedwood conditions, which will complement the existing guides for managing jack pine, black spruce, and trembling aspen on boreal ecosites in Ontario. It is scheduled for release in 2002 along with the balance of the *Boreal Mixedwood Notes*.

Bill Towill, senior forest practices specialist with MNR's Northwest Science and Information Section, says that development of the guide is well underway. "It will include more information on succession and will profile the application of an initial suite of management strategies to broad groupings of hardwood-softwood site and stand conditions. Interim results of several mixedwood research studies in Ontario will be incorporated into it."

For more information about boreal mixedwood research projects, contact Blake MacDonald (ext. 223) or Jim Rice (ext. 222). For a copy of **Harvesting Boreal Mixedwood Stands to Favour Conifer Regeneration: Project Establishment and Early Results** *(Forest Research Report No. 157), call OFRI's publication request line at ext. 271, or e-mail information.ofri@mnr.gov.on.ca. To purchase a copy of the* **Boreal Mixedwood Notes** *($30), call (800)667-1940 or e-mail mnr.nric@mnr.gov.on.ca.*

OFRI STAFF PROFILE

Bill Parker

By Abigail M. Obenchain

An increased emphasis on natural regeneration in Ontario is what brought research scientist Bill Parker to OFRI 9 years ago. "Over the past 20-30 years, most forest ecophysiology research has focused on seedlings planted in clearcuts," he says. "Examining the ecophysiology of natural regeneration, particularly in partial cutting systems, has received relatively little attention.

"To address the lack of information in this area, I was hired to look at how natural regeneration responds physiologically to various treatments. The objective of this work was to improve our ability to manage for natural regeneration. Since that time, however, I have become involved in ecophysiology research in many other areas as well."

"It's helpful to be part of a large team of scientists studying white pine ecosystems to develop improved management practices for this species."

His areas of concentration have included vegetation management alternatives; site preparation, harvesting methods, and partial cutting; artificial vs. natural regeneration systems; ice storm damage; intensive forest management; and climate change. Particularly notable has been his work on various aspects of white pine regeneration *(see lead article in this issue)*.

"It's helpful to be part of a large team of scientists studying white pine ecosystems to develop improved management practices for this species," Parker maintains. "We're all studying specific aspects of the regeneration question, with our results providing the pieces needed to solve the puzzle. We *will* get to a point where we have the knowledge to manage the white pine resource sustainably."

He adds that he enjoys the applied nature of research at OFRI. "We work closely with people in the field, and in many ways that's more rewarding than the 'academic' research I was involved in in the past. You feel like you can really influence the way forestry is practiced."

Before coming to OFRI, Parker was a plant scientist for Weyerhaeuser in Tacoma, WA, working on improving technology to preserve plants for commercial use. He has a PhD in tree physiology/forest ecophysiology from the University of Missouri at Columbia.

What is *ecophysiology*?

Ecophysiology is the study of how plants respond physiologically, or internally, to what's happening around them. Incorporating ecophysiology into silviculture research reveals *why* one treatment may favour crop seedling growth and another gives the advantage to competitors.

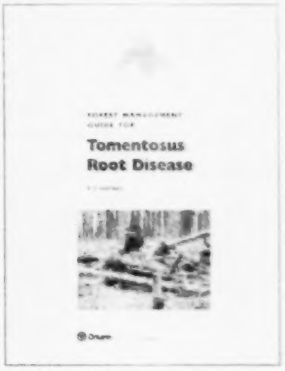
For example, during a study of white pine seedlings near Wharncliffe, OFRI scientists learned that competition for light is the key physiological factor affecting regeneration in this ecosystem: The species that gets the most light wins the race for survival. By tailoring vegetation management to the weed species present, the performance of white pine regeneration can be improved in an effective, efficient manner.

Ecophysiology is an important part of climate change research because it can provide insight into how trees take in and store carbon dioxide gas, one of the major contributors to climate change. Learning more about how trees store carbon, and how our management practices affect this stored carbon, is increasing our ability to use forests and forestry to mitigate the effects of climate change.

Need help managing Tomentosus?

The *Forest Management Guide for Tomentosus Root Disease* is now available from OFRI. Written by Roy Whitney, a retired Canadian Forest Service research scientist, this 20-page bilingual guide is geared to the practicing forester and provides a wealth of information not just on identifying and understanding Tomentosus but also on managing its spread and impact. It features colour photos to aid in identification as well as handy decision keys for detecting and managing the disease.

According to OFRI forest health research forester Sylvia Greifenhagen, Tomentosus can cause significant wood fibre losses in conifer plantations. Pure spruce stands are particularly vulnerable, as they provide this fungus with a nearly continuous mat of its favourite food: spruce roots. As intensive forest management increases, factors that affect tree growth (such as Tomentosus) are likely to become an even greater concern for forest managers.



To get a copy of the Forest Management Guide for Tomentosus Root Disease, call OFRI's publication request line at ext. 271 or e-mail information.ofri@mnr.gov.on.ca.

OFRI welcomes **Jim McLaughlin** (ext. 213), the new forest soils research scientist. His responsibilities include investigating the effects of forest harvesting and wildfire on soil nutrient cycling, hydrology, and water quality; providing research information for provincial sustainable forest management guidelines; and conducting technology transfer activities for forest industry, provincial agencies, environmental groups, and the public. Previously, Jim was a senior environmental planner with the Houston-Galveston (Texas) Area Council and a regional monitoring coordinator for the Texas Clean Rivers Program.

Welcome as well to **Connie Bouffard** (ext. 258), coordinator of building administration, operations, and technical services at OFRI. Previously, Connie worked as a building contract administrator for Ontario Realty Corporation.

Another new face is **Kevin Maloney** (ext. 293), propagation technician, who provides technical support to science projects in the building and at the OFRI Arboretum and assists with building operations. He came to OFRI from OMNR's Chapleau District Office, where he was leader of a forest fire attack crew.

Terry Taylor (ext. 247) has returned to his position as OFRI science management leader for resources and program planning, after a 2-year stint as manager, Sault Ste. Marie Area Economic Development Team, Ontario Ministry of Northern Development and Mines. **Vivienne Scott** (ext. 122), who sat in for Terry during his absence, is now OFRI's science management leader for program and policy development/silviculture. **Tim Meyer** (220) is OFRI's new science management leader for strategy and partnerships; he had been in a temporary manager position and before that was the provincial forest pathologist.

Farewell to renowned OFRI physiology scientist **Gina Mohammed**, who recently stepped down after 10 years of dedicated service to the citizens of Ontario. During her time at OFRI, she had a hand in a broad range of innovations, including:

- Developing tree vigour and viability tests, for example, a physiological test to forecast competitive tolerance using a 1-day stress test (see Insights *Vol. 3, No. 1*)
- Adapting chlorophyll fluorescence methods as a stress indicator (Insights *Vol. 2, No. 2*)
- Developing stress tests for mycorrhizal seedlings
- Helping to develop a fluorescein diacetate test for seed viability (Insights *Vol. 2, No. 2*)
- Extending physiological tests to aquatic, agricultural, and medicinal plants for government and industrial clients in Canada and the United States
- Assessing opportunities for non-timber forest products and making recommendations for sustainable development in Ontario (Insights *Vol. 4, No. 2*)
- Leading the Bioindicators Project (Insights *Vol. 3, No. 2*), which involved scaling up physiological testing to the stand scale using hyperspectral methods, as part of the federal National Centres of Excellence Geomatics Network (Insights *Vol. 4, No. 1*) and with partners such as NASA, the Canadian Space Agency, and CRESTech

Mohammed will remain in Ontario and will concentrate on science writing and consulting, particularly related to non-timber forest products; science projects, including working with NASA scientists to design and launch the first chlorophyll fluorescence monitoring satellite; and a stained-glass art business.

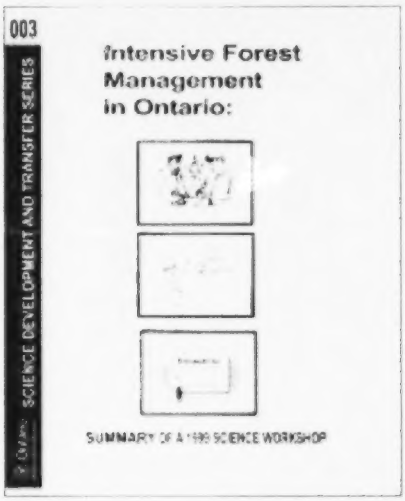
Summary of Ontario IFM workshop now available

In early December 1999, over 200 participants from across Ontario attended an Intensive Forest Management (IFM) Workshop in Sault Ste. Marie, hosted by the Ontario Ministry of Natural Resources (OMNR), the Canadian Forest Service, and forest industry. Recommendations generated through the workshop have been published in an OMNR report titled *Intensive Forest Management in Ontario: Summary of a 1999 Science Workshop*.

This report focuses on what practices, tools, and social, environmental, and economic issues are most relevant to IFM in Ontario and where science and information gaps exist or are likely to develop in the near future.

These recommendations are being used to help develop the science strategies needed to implement IFM in Ontario. Tembec, one of the major sponsors of the workshop, has already begun implementing IFM-related research and operational projects in cooperation with OMNR, the Canadian Forest Service, and the Canadian Ecology Centre *(see related article on research partnerships in this issue)*.

To receive a copy of Intensive Forest Management in Ontario: Summary of a 1999 Science Workshop *(OMNR Science Development and Transfer Series Report No. 003), contact the OFRI publication request line at ext. 271 or e-mail information.ofri@mnr.gov.on.ca. A PDF version is available for downloading at http://www.mnr.gov.on.ca/MNR/forests/t&t_research/publications/publications.htm.*



Upcoming events

June 10-15
The Stream Assessment Protocol for Ontario, Dorset, ON. For field crews and resource managers involved in stream management and field inventory programs. Contact Laurie Allin or Les Stanfield, MNR Salmonid Ecology Unit, (613)476-8966 or (613)476-8777, e-mail laurie.allin@mnr.gov.on.ca or les.stanfield@mnr.gov.on.ca.

June 24-27
Third North American Forest Ecology Workshop: Issues of Scale – From Theory to Practice, Duluth, MN. For registration information, contact Mary Ann Hellman at (612)624-7222 or mhellman@forestry.umn.edu or visit http://www.cnr.umn.edu/cfc/outreach/NAFEW/nafew.html.

October 15-19
Old-Growth Forests in Canada: A Science Perspective, Sault Ste. Marie, ON. For registration information, contact the Upper Lakes Environmental Research Network (ULERN) at (705)759-2554, ext. 497, or see http://www.ulern.on.ca/oldgrowthforest/index.html. For program information, contact Bruce Pendrel, Canadian Forest Service, Fredericton, (506)452-3505, oldgrowth@nrcan.gc.ca.

Have a suggestion?
Want more information on a research project?

We want to hear from you!

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